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MATH 361 HW ch. 4.2

✓✓x x
#1,2,5,6

Problem 1

a.) $f(x) = \ln(x)$, $x_0 = 1$, $h = 0.4$

	K=	1	2	3
x_0	1	$O(h)$	$O(h^2)$	$O(h^3)$
$h =$	0.4	.841181		
$h/2 =$	0.2	.911608	.982035	
$h/4 =$	0.1	.953102	.994696	.998783
$h/8 =$	0.05	.976803	.998609	.99983

b.) $f(x) = 2^x \sin(x)$, $x_0 = 1.05$, $h = 0.4$

	K=	1	2	3
x_0	1.05	$O(h)$	$O(h^2)$	$O(h^3)$
$h =$	0.4	2.29037		
$h/2 =$	0.2	2.30326	2.32013	
$h/4 =$	0.1	2.29524	2.28822	2.27358
$h/8 =$	0.05	2.28638	2.27782	2.27495

c.) $f(x) = x + e^x$, $x_0 = 0$, $h = 0.4$

	K=	1	2	3
x_0	0.0	$O(h)$	$O(h^2)$	$O(h^3)$
$h =$	0.4	2.22986		
$h/2 =$	0.2	2.10701	1.98446	
$h/4 =$	0.1	2.05171	1.99641	2.00039
$h/8 =$	0.05	2.02842	1.99913	2.00004

d.) $f(x) = x^3 \cos(x)$, $x_0 = 2.3$, $h = 0.4$

	K=	1	2	3
x_0	2.3	$O(h)$	$O(h^2)$	$O(h^3)$
$h =$	0.4	-24.221		
$h/2 =$	0.2	-22.066	-19.981	
$h/4 =$	0.1	-20.872	-19.688	-19.580
$h/8 =$	0.05	-20.263	-19.664	-19.653

Problem 2

a.) $f(x) = \ln(x)$, $x_0 = 1$, $h = 0.4$

	K=	1	2	3	4
x_0	1	$O(h)$	$O(h^2)$	$O(h^3)$	$O(h^4)$
$h =$	0.4	.841181			
$h/2 =$	0.2	.911608	.982035		
$h/4 =$	0.1	.953102	.994596	.998783	
$h/8 =$	0.05	.976803	.998609	.999303	.999960

b.) $f(x) = 2^x \sin(x)$, $x_0 = 1.05$, $h = 0.4$

	K=	1	2	3	4
x_0	1.05	$O(h)$	$O(h^2)$	$O(h^3)$	$O(h^4)$
$h =$	0.4	2.29837			
$h/2 =$	0.2	2.30536	2.32015		
$h/4 =$	0.1	2.29524	2.28622	2.27356	
$h/8 =$	0.05	2.28638	2.27782	2.27495	2.27515

c.) $f(x) = x + e^x$, $x_0 = 0$, $h = 0.4$

	K=	1	2	3	4
x_0	0.0	$O(h)$	$O(h^2)$	$O(h^3)$	$O(h^4)$
$h =$	0.4	2.22986			
$h/2 =$	0.2	2.10701	1.98446		
$h/4 =$	0.1	2.05171	1.99641	2.00039	
$h/8 =$	0.05	2.02842	1.99913	2.00004	1.99999

d.) $f(x) = x^3 \cos(x)$, $x_0 = 2.3$, $h = 0.4$

	K=	1	2	3	4
x_0	2.3	$O(h)$	$O(h^2)$	$O(h^3)$	$O(h^4)$
$h =$	0.4	-24.221			
$h/2 =$	0.2	-22.066	-19.981		
$h/4 =$	0.1	-20.872	-19.688	-19.580	
$h/8 =$	0.05	-20.263	-19.654	-19.653	-19.668